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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/711,908	11/15/2000	Norikatsu koide	PM268415	8191

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PILLSBURY WINTHROP, LLP
P.O. BOX 10500
MCLEAN, VA 22102

EXAMINER

LOUIE, WAI SING

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 04/10/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/711,908

Applicant(s)

KOIDE ET AL.

Examiner

Wai-Sing Louie

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 21-27 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

- In claim 21, the formula, wavelength λ (nm) = $1239.8/E_g$ (eV), $E_g \leq 3.4*(1-x) + 1.95*x - 1.0*x*(1-x)$ is not supported by the specification. For the purpose of examination, wavelength λ (nm) = $1239.8/E_g$ (eV), $E_g \leq 3.4*(1-x) + 1.95*x - 4.26*x*(1-x)$ is used.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 21-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe (US 5,537,433) in view of Shakuda (US 5,557,115).

With regard to claims 21-24, Watanabe discloses a method of manufacturing a light-emitting device, LED (col. 9, line 8 to col. 19, line 6 and fig. 15) comprising forming a light-emitting layer 303 comprised of InGa_xN over a sapphire substrate 300 (col. 14, line 24), but does not disclose the In_xGa_{1-x}N light-emitting layer having an indium mole fraction and emits light wavelength λ (nm) = $1239.8/E_g$ (eV), $E_g \leq 3.4*(1-x) + 1.95*x - 4.26*x*(1-x)$. However, Shakuda discloses a blue light LED having the indium mole fraction is set 0.15 (Shakuda col. 4, line 12) and the light-emitting layer emits light have a peak wavelength of 470 nm, which meets the mole fraction calculated by the above formula (Shakuda col. 4, lines 19-21). Shakuda teaches to regulate the ratio of In to Ga in the light emitting compound could change the wavelength of light emitted by the LED (Shakuda col. 4, lines 27-29). Therefore, it would have been obvious to one with ordinary skill in the art to regulate the mole fraction of Indium in order to control the desired light emission.

With regard to claims 25 and 26, Watanabe modified by Shakuda do not disclose another range of indium mole fraction of 0.19 to about 0.26, which emits green light having a peak wavelength ranging from 510 to 530 nm. However, Shakuda teaches that the mixture ratio of Indium to Gallium in the light-emitting layer increases, the wavelength of the light generated at this layer also increases (Shakuda col. 4, lines 27-29). The LED can be made to emit light of different color such as green (Shakuda col. 6, lines 59-61). Therefore, it is obvious that LED could emit green light, which has a wavelength about 520 nm, if Shakuda changes the indium mole fraction such as 0.19-0.26.

With regard to claim 27, Watanabe discloses the method of manufacturing the LED (fig. 15) comprising:

- Disposing a buffer layer 301 comprising AlN on the sapphire substrate 300;
- Interposing a first clad layer 302 comprising n-GaN between the buffer layer and the light-emitting layer;
- Forming a second clad layer 304 comprising p-GaN, but Watanabe does not disclose the p-GaN layer is doped with magnesium. However, magnesium is a common material for p-type doping. Therefore, it is obvious magnesium is used to dope the p-GaN layer 304.

Claims 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe (US 5,537,433) modified by Shakuda (US 5,557,115) as applied to claim 21 above, and further in view of Ishikawa et al. (US 5,977,565).

With regard to claim 28, Watanabe modified by Shakuda do not disclose depositing a p-side electrode 306, which is transparent and is made of gold, on the second clad layer. However, Ishikawa et al. disclose the electrode 107, which is transparent and is made of gold (col. 6, lines 63-65). Ishikawa et al. teach the transparent gold electrode layer would increase the light-emitting area (col. 7, lines 1-4). Thus, it would have been obvious at the time the invention was made to have a transparent electrode layer in order to transmit light through a larger area.

With regard to claims 29 to 31, Watanabe modified by Shakuda do not disclose an interposing layer comprising p-AlInGa_xN, which has a formula of In_xAl_yGa_{1-x-y}N. However, Ishikawa et al. disclose second cladding layer 104 is p-In_xAl_yGa_{1-x-y}N (Ishikawa col. 8, line 46)

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and third cladding layer 126 of p-GaN (fig. 5). One with ordinary skill in the art would have an interposing layer, which acts as a carrier confinement layer. Therefore, it is obvious to have an interposing layer in order to confine the carrier toward the active layer. Shakuda disclose the p-type dopant could be magnesium, which is a group IIA element (Shakuda col. 4, line 26).

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe (US 5,537,433) modified by Shakuda (US 5,557,115) as applied to claim 21 above, and further in view of Nitta et al. (US 6,258,617).

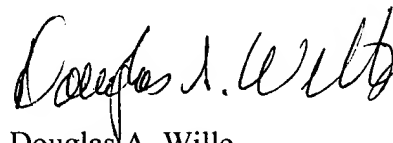
With regard to claim 32, Watanabe discloses the layers are grown as crystals by a metal organic vapor phase epitaxial (MOVPE) growth method (col. 9, line 22), but does not disclose the reactive gases are nitrogen, ammonia, and alkyl compound gases containing a group III element. However, Nitta et al. disclose forming a blue light GaN-based semiconductor light-emitting device by MOVPE method and the layers contain In, Ga and Al, which is group III elements (Nitta col. 3, lines 15-17). Nitta et al. disclose the reactive gases used in the process are nitrogen, ammonia, and alkyl compound gases (Nitta col. 4, lines 15-29). Hence, it would have been obvious at the time the invention was made to use nitrogen, ammonia, and alkyl compound gases in Watanabe's device in order to build the III-V GaN-based semiconductor layers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (703) 305-0474. The examiner can normally be reached on 7:30 AM to 4:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Douglas A. Wille
Patent Examiner



wsl

April 5, 2002